hc-tronic

DATATRAP V2.0

The mobile datalogger

OWNERS MANUAL

CONTENTS

1. Getting started 3
2. Operation 4
3. Configuration 6
4. Connection of sensors 8
5. Pin assignment 15
6. Alarm Control - Output 16
7. Datalogging 17
8. Reading out the data 18
9. Alarm function 20
10. Trigger function 21
11. Recording timer 22
12. DCC - DATATRAP Control Center 23
13. Remote control 27
14. Using a GSM modem (e.g. TC35T by Siemens) 31
15. Modem power management 34
16. Reserved control characters 35
17. Trouble shooting 36
18. Technical data 37
19. Warranty conditions 38

1. Getting started

To start, you have to insert the enclosed rechargeable battery. To do this, you open the battery compartment on the backside. You should only use 9V-NiMH accumulators, as with an external power supply buffered charging of the battery takes place. We do not assume liability, if a non-rechargeable battery is used.
Upon attachment of a power source, the DATATRAP resumes the configuration retained last.

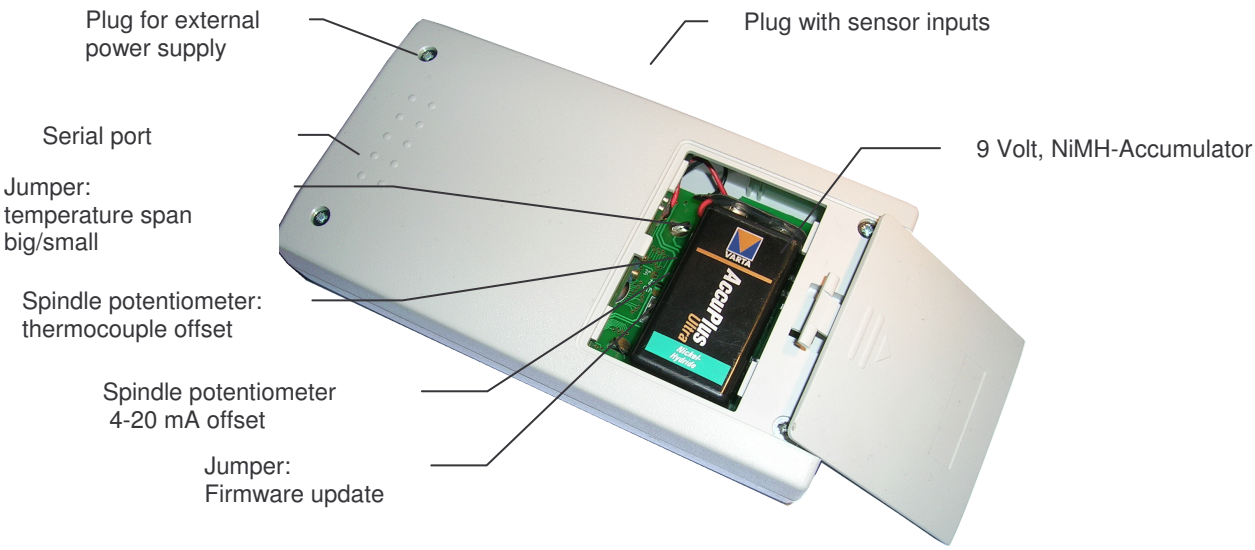


Fig.1

The DATATRAP can also be operated with the included mains adapter. If you use other adapters or external batteries such as, for example, a lead accumulator, pay attention to the polarity of the plug: „plus“ at the interior, „minus“ at the exterior position. The attachment to external or internal power supplies is protected from polarity errors; however, in case of a wrong polarity, the power supply is cut off or, respectively, there is no buffering of the battery.
Using the enclosed mains supply plug, the process of charging the battery takes 24 to 48 hours, since it is adjusted to maintain a constant charging rate (charging current approx. 3 mA). If the DATATRAP is not used for a longer period of time, the battery should be removed. If measurements are taken in large time intervals or if the instrument is kept in the standby mode, it can be operated for a period of 3-4 weeks.

2. Operation

The DATATRAP is operated using the five buttons of the keypad. The four outer buttons direct the steps going through the menu. The central button (in the following called ENTER button) serves to confirm a selection.
If no more button is pushed, there is one minute of delay until the DATATRAP automatically switches over into an energy saving mode. It will be activated again by pushing any one of the buttons.

Symbols:

Cursor: indicates possible alternative branching. The option is elected by the up- or down-key. Branching is performed by the right-hand button, while you can return by pressing the left-hand button.

Here you have to push the ENTER button to make a selection or confirmation, respectively. It branches also to the up- or down-key for adjustment.

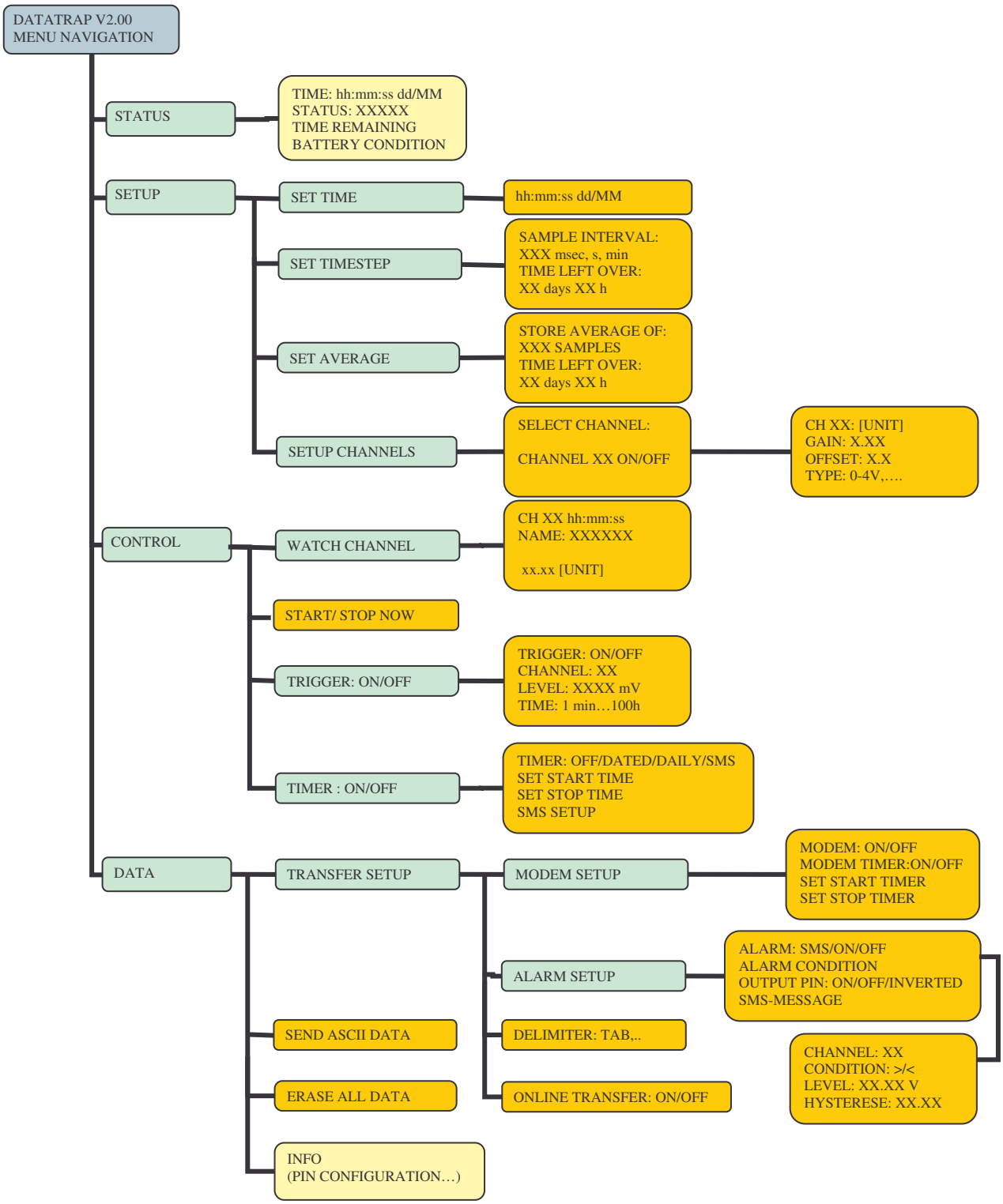
Use the up- or down-key to choose a value. By confirming it with the ENTER button you leave this mode.

Shows that the internal timer is active. When the specified time has elapsed, the DATATRAP starts or stops the logging or the modem, respectively.

Flashing indicates that the DATATRAP is in the mode of logging.

The following chart presents a scheme of the DATATRAP menu showing the possibilities of navigation.

Menu overview

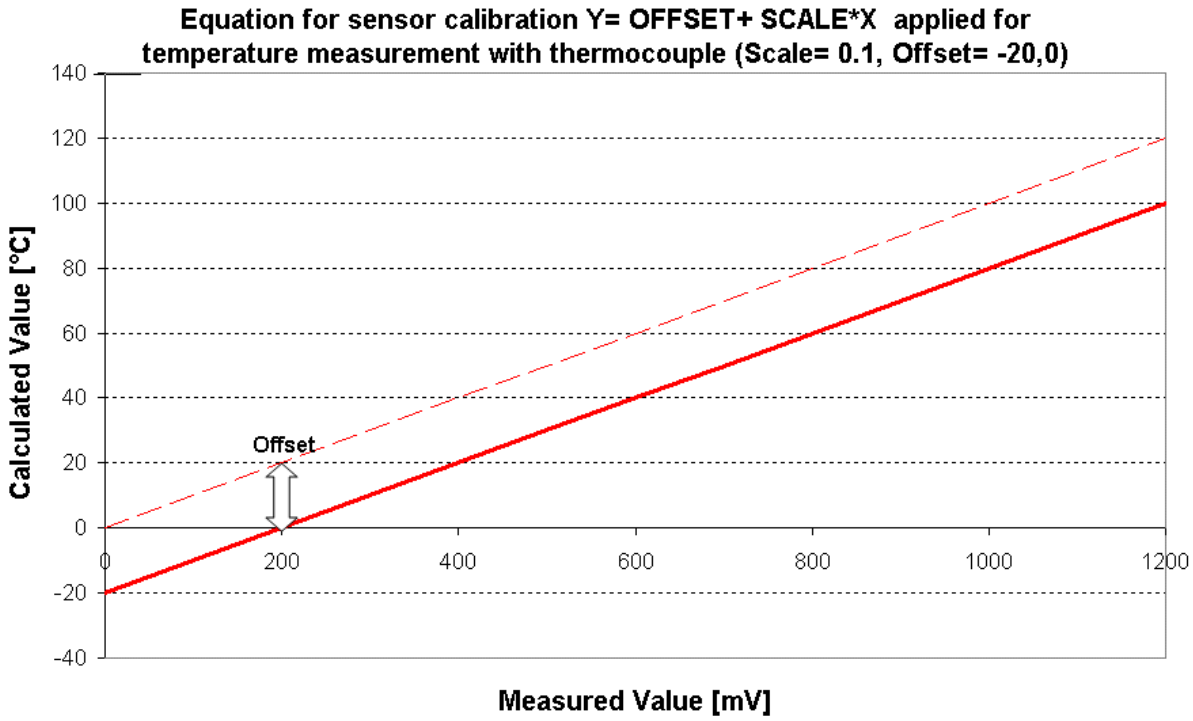


3. Configuration

The parameters for the logging of measured signals are selected in the **SETUP** menu. The clock of the system is set in the submenu **TIME.** Move the cursor to the left or right to vary the desired time-unit with the up- or down-key. The format of time is displayed as hours : minutes : seconds days/months. The new time is stored by pushing the ENTER key.
To set the interval of measurements, you go to the submenu SET TIMESTEP. Use again the up- or down-key to vary the value. The maximum sample interval is 60 min, the smallest interval 50 milliseconds. The lowermost line of the display shows the time that is available for data logging at the present settings and storage capacity. If intervals shorter than 200 ms are chosen, the ONLINE function for transferring actual measurements in the ASCII format is automatically switched off. In the cases of intervals smaller than 100 ms and activation of many channels, the stand-by mode of the DATATRAP may become inactive. One may then expect a higher power consumption (> 10 mA) and a shorter lifetime of the battery.
In the menu **SET AVERAGE** you can choose the number of measurements to be used for the calculation of average values. The number can be between 1 and 200. The recorded values are spaced at a time interval resulting from the product of timestep and number of averaged values. Thus, at an interval of 1 second and an average of 60 values, the calculated average is recorded once per minute. The more values you use for the calculation of the average, the better is the resolution. Noise-dependent distortions of signals can thus be smoothed out digitally by average formation.
The 16 channels can be singly activated or deactivated in **CHANNEL SETUP.** To do this, you select the channel with the up- or down-key and activate/deactivate it with the ENTER key. By pressing the control button on the right every channel can be configured in a menu. After pressing the ENTER key, the values can be varied in every line. In the first line the unit is chosen and the momentary measured value is shown. The value can be adjusted by the scaling factor (**SCALE)** and by the **OFFSET**. The result shown (Y) is calculated from

$$Y = OFFSET + SCALE^* X$$

The OFFSET can also be set automatically: first you press ENTER, so that the OFFSET value can be varied, then you press the RIGHT button. Now the negation of the input value of the channel is used as OFFSET such that the displayed value is zero. The OFFSET is adjusted manually using the up- or down-key and ENTER for confirmation.



The type of input is chosen from **TYPE**. The available modes are 0-4V, 0-400V, 4-20mA and thermocouple input. Consider, however, that the channels 1, 2 and 3 are operated via a voltage divider, thereby allowing a range of measurements of 0-40V (and so doesn't serve for thermocouples). Channel 16 provides an input for frequency measurements and counting. Names can be assigned to the channels via **DCC** (**D**atatrap **C**ontrol **C**enter); they are then shown with the measured values in the logger display and in the data files.

If the configuration should get lost, for instance with low batteries (only possible with types of batteries other than NiMH), you should reload the basic configuration. To do this, you have to disconnect the batteries and external power supply and start again with the external power supply. Thereby you have to keep the ENTER button pressed, until **DEFAULT CONFIGURATION** appears in the display. In this process your data will be conserved. The configuration data of the measurements recorded last can be restored by reading them from the DCC and by overwriting the basic configuration.
The basic configuration for all channels is:

- STATUS: OFF
- UNIT: mV
- SCALE: 1.00
- OFFSET: 0.0
- TYPE: 0-4 V
- TIMESTEP: 1 s
- AVERAGE OUT OF: 1 SAMPLE

4. Connection of sensors

Using the software, each channel can be defined as an input for 0-4V, 0-400V, 4-20mA or for thermocouples of the type K (NiCr-Ni). The channels 1, 2 and 3 are provided only for voltages of 0-40V. All channels are **unipolar inputs** which means, that the potentials of all signals relate to the common ground. The following figures show possible connections for various types of signals and sensors. If the type of measurement remains the same, the sensors should be soldered permanently to the sensor jack. If one wants to expand flexibility, an additional board with terminal strips, allowing simple conditioning of the signal is available. In order to reduce the power consumption, sensors requiring a 5V supply can be connected to a pin of the input jack that switches to 5V at the moment of measurement. This functions with a sensor heat up time of a few milliseconds.

! ATTENTION !

Channels 1 to 3 must not be exposed directly to more than 41 V, channels 4 to 15 not to more than 5 V. Reversed polarity of voltages of more than -0.5 V between channel and ground can destroy the input multiplexer!

VOLTAGE MEASUREMENT:

Without any further adaptation, voltages of 0 - 409,6 mV or 0 - 4,096 V can be measured with a resolution of 0,1 mV or 1 mV respectively, as shown in Fig.2. Channels 1-3 are internally equipped with a voltage divider of 1:10, so the input voltage can be from 0 - 40,96V and have a resolution of 10mV.

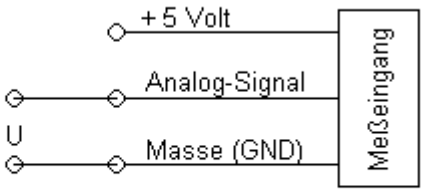
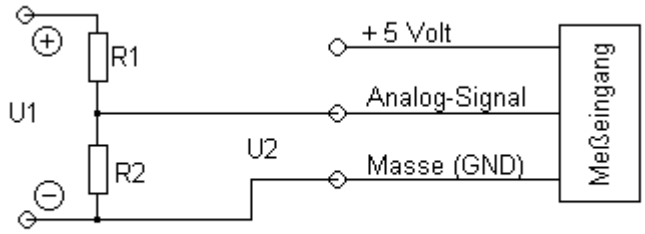


Fig.2

If higher voltages are to be measured, a voltage divider must be added as shown in Fig.3. The resistance values should not be chosen too high, since otherwise the internal resistance of the instrument (1 MΩ) would be predominant.

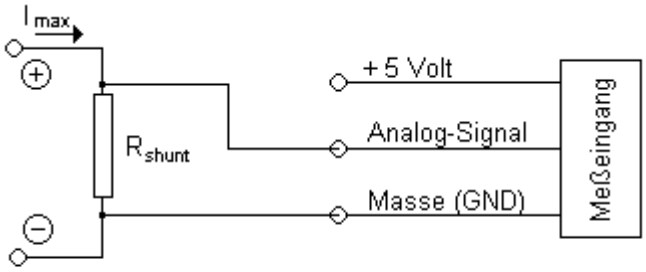


$U2 = U1 \times R2/(R1+R2)$

Fig.3

MEASUREMENT OF CURRENT:

In the case of current measurements, the decline of voltage over a resistor with low resistance, a shunt, is measured (Fig.4). The shunt is positioned in series with the sensor or consumer, respectively. You should use the mode of 0-400mV, so that a small shunt can be chosen. The smaller the shunt, the less it is heated up and the more constant the conditions (temperature drift).

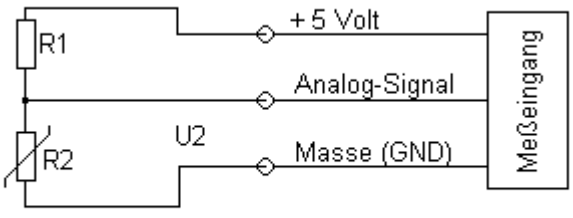


$R_{shunt} = U / I_{max}$

Fig.4

MEASUREMENT OF RESISTANCE:

Several sensors show a change of resistance with the change of the physical parameter. If a voltage divider is constructed with any one of these sensors according to Fig.5, the voltage can be measured by the data logger. Depending on the mode of input, U2 should not exceed 409,6 mV or 4,096 V, respectively.



$U2 = 5V \times R2/(R1+R2)$

Fig.5

TEMPERATURE MEASUREMENT:

You have various possible choices to measure temperature. The most flexible and robust method, although not the most accurate one, is the use of **thermocouples.** The standard range of measurements with the DATATRAP V2.00 is between –50°C and +350°C, with a resolution of 0,1°C. The range of measurements can be expanded by setting the internal jumper to high temperature (-50- 1000°C). Thereby the resolution is decreased to 0.33°C. For thermocouple measurements, type TC/NiCrNi must be selected. As the characteristic of thermocouples is not perfectly linear, the accuracy of measurements with NiCrNi (type K) elements between –25°C and 100°C is roughly +/- 1°C. The measurement can be improved by processing the recorded data according to an algorithm of linearization (see below). The negative pole of the thermocouple is connected with the sensor input channel on the connector, the positive pole with the common ground. During operation one should take care that the plug to which the thermocouples are soldered has the same temperature as the instrument. The instrument should therefore not be exposed to direct sunlight or to great changes in temperature. You thus avoid errors of measurement, since the thermo voltage arising at the solder joints must be balanced by a temperature sensor located in the instrument.

To be able to measure temperatures below freezing point, the sensor system is provided with a voltage offset shifting the origin in positive direction. The hardware offset can be varied with an internal spindle potentiometer (see Fig.1). This offset must be balanced by a digital OFFSET in order to achieve the correct reading in the menu CHANNEL SETUP. Temperatures below zero are then displayed with a minus symbol. The offset is most simply adjusted in AUTO mode. To do this, you dip the sensor into ice water (0°C) and push the right-hand arrow button when in offset configuration mode. The temperature display then jumps to zero. The SCALE factor (0,1) should normally not be changed, because the internal amplifier is laser calibrated. It is possible to use cables longer than 10 m. However, this may increase disturbances depending on the surroundings. Shielding with mass contact may then help. Since the cable represents a resistor, long cables may eventually require adaptation of the SCALE factor.

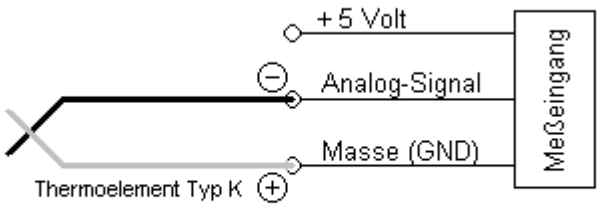


Fig.6

LINEARISATION OF THERMOCOUPLES

The linearisation has to be done by processing the data in a table calculation program using the following formula (error in the range of 0°C – 500°C: +/- 0.05°C):

$$T = a_0 + a_1 \cdot U + a_2 \cdot U^2 .... + a_n \cdot U^n$$

mit U = (U_{mess}[V]/247,3) – 11E-6

For thermocouples of type K following values for constants a_0 to a_n are used:

a_0 = *0,0*
a_1 = *7,860106E-8*
a_2 = *-2,503131E-10*
a_3 = *8,315270E-14*
a_4 = *-1,228034E-17*
a_5 = *9,804036E-22*
a_6 = *-4,413030E-26*
a_7 = *1,057734E-30*
a_8 = *-1,052755E-35*

Settings in the DATATRAP: SCALE=1, OFFSET= value of calibration, TYPE= TYP-K/NiCrNi.

These settings yield measurements ($U_{measure}$) in mV (Divide by 1000 to obtain Volts [V]).
Please find an implementation under EXCEL on the CD coming with the DATATRAP.

SEMICONDUCTOR TEMPERATURE SENSORS

For the range of measurements between –20°C and 125°C there are several highly accurate integrated temperature sensors which, however, are more expensive than thermocouples. If they are used, one has to consider that their signal can be influenced considerably by the length of the cable. Figs. 7 and 8 demonstrate two examples of their use.

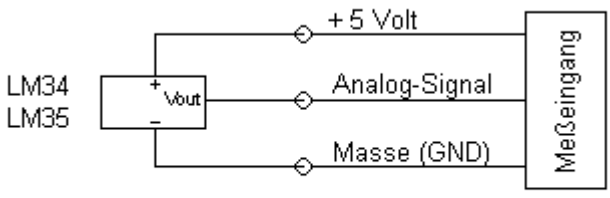


Fig. 7

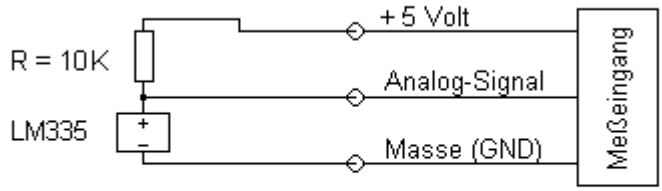


Fig. 8

THERMISTORS

Thermistors can be used in the range of –80°C to 150°C. They are not clearly linear, but they are not expensive and owing to their signal levels, less subject to interferences than thermocouples. The measurements are linearized according to the equation:

Temperature (K) = 1/(A+B*ln(R) + C*ln(R))

A, B and C are constants which are specific for the model of the thermistor and are given by the manufacturer. The linearization must be done in the processing of the data by programs of table calculation.

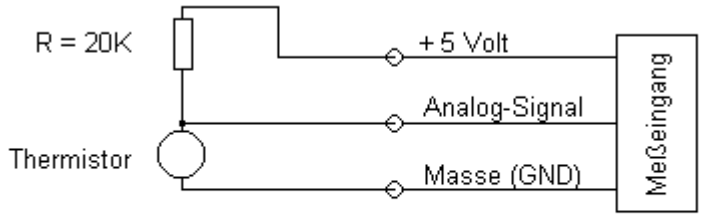


Fig.9

SENSORS WITH 4 – 20 MA SIGNALS:

These sensors (transmitters) which are commonly used in industry give signals which are extremely insensitive to interference and are independent of cable length. But these sensors must often be operated with at least 10V, so that an additional power source is necessary.

The signal current is converted to a voltage via a 100 Ohm resistor. If the input type chosen on the DATATRAP is 4-20 mA, the signal offset can be scaled with an internal spindle potentiometer (see Fig.1). At a current of 4 mA the hardware-offset is set with the spindle potentiometer in such a way that the reading is 0. At a current of 20 mA the resulting measured value of 4096 mV is displayed at the upper end of the scale.

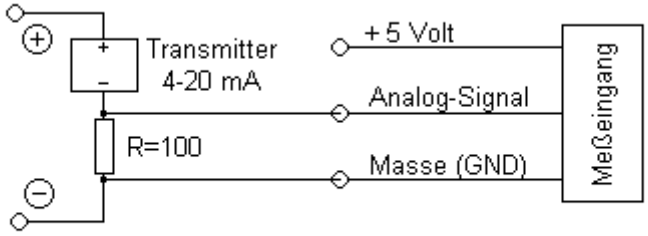


Fig.10

COUNTER AND FREQUENCY MEASUREMENTS:

Channel 16 serves to register pulses by counting or in form of a frequency measurement. Signals exceeding 2,5V are thereby classified as digital HIGH, signals with less than 2,0V as LOW. The duration of the impulse must at least be 1 microsecond to be recognized reliably. A signal voltage of 24 V at the input should not be exceeded. The **counter** counts up from 0 to 32.768. Above this number it starts again at zero. The counter is reset at the start of recording. The **measurement of frequency** can deal with frequencies in the range of 0 to 32,768 kHz. At higher frequencies the internal counter starts again at zero. The resolution of measurements of low frequencies is improved by measuring over longer intervals. Instead of expressing second-based measurements in Hertz, the display can also be defined in terms of pulses per time interval chosen by the user [1/t] or of period length (in ms).

MEASUREMENT OF LIGHT INTENSITY

Light intensity can be quite accurately measured by the short-circuit current of a photodiode. But one has to keep in mind that the photo diode covers only a small part of the spectrum. A sensor calibrated for sunlight can thus yield false values for artificial light because of the different spectrum. A further factor of disturbance is the temperature of the diode, since the short circuit current increases with temperature. Use the range of 0-400 mV for measurements in the circuit shown in Fig.11. Ready-made sensors such as TSL250 are already available.

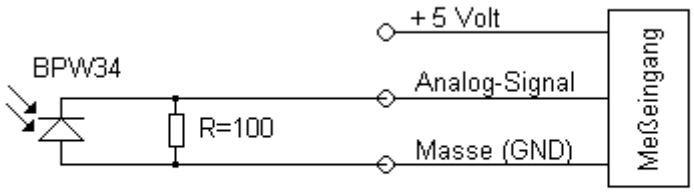


Fig.11

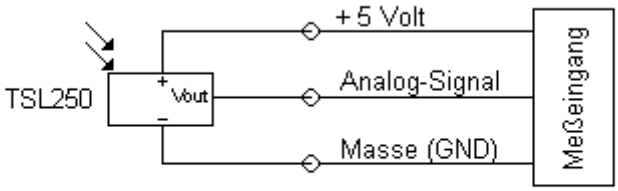


Fig.12

MEASUREMENT OF PRESSURE

Pressure sensors with preconditioned signals are available which can directly be connected to the datalogger. Fig.13 shows the usage of the barometric pressure sensor MPXS4100. Sensors of this type require an operational current of approximately 2-5 mA and thereby reduce the lifetime of the battery.

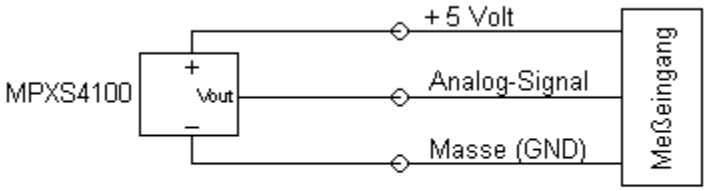
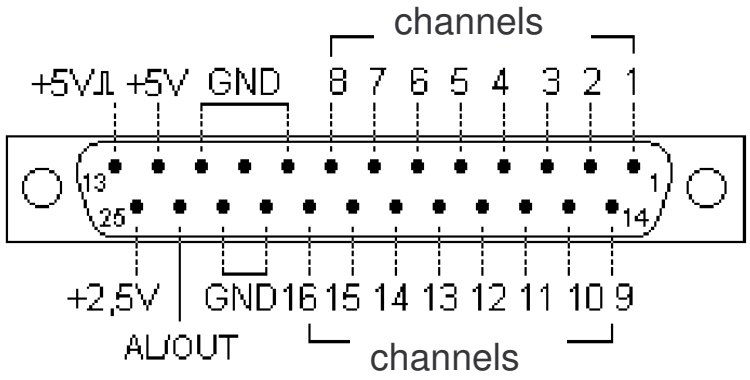


Fig.13

5. Pin assignment



Pin assignment at measurement connector of the DATATRAP

1. Channel 1 0-40 V max.
2. Channel 2 0-40 V max.
3. Channel 3 0-40 V max.
4. Channel 4 4 V max.
5. Channel 5 4 V max.
6. Channel 6 4 V max.
7. Channel 7 4 V max.
8. Channel 8 4 V max.
9. Ground
10. Ground
11. Ground
12. 5 V, 50mA max.
13. 5 V switched on during measurement, 50mA max.
14. Channel 9 4 V max.
15. Channel 10 4 V max.
16. Channel 11 4 V max.
17. Channel 12 4 V max.
18. Channel 13 4 V max.
19. Channel 14 4 V max.
20. Channel 15 4 V max.
21. Channel 16 Counter input (Signal > 1,6V=high, 40 V max.)
22. Ground
23. Ground
24. Alarm output (Open Drain (active low ,10mA), high 5V, 2mA)
25. Referenz 2,5 V (+/- 20mV), 1 mA max., (1KOhm in series)

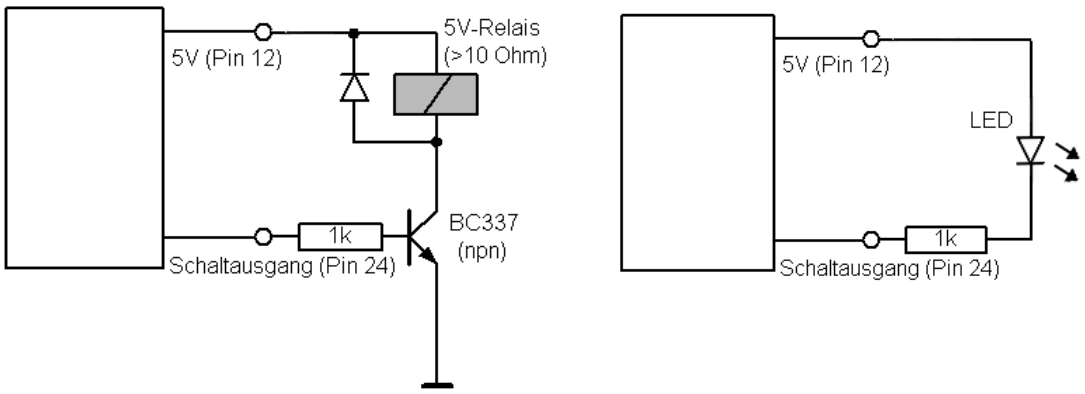
6. Alarm Control - Output

DATATRAP V2.0 has a digital output (pin 24) for control of external instruments. In the active state the output is connected to ground (open drain) and can yield a current of up to 15 mA. In the inactive state, the pin carries 5V and can supply maximally 2 mA.
There are several possibilities to control the output.

1. In the datalogger, under the menu section **SETUP - SETUP CHANNELS - OUTPUT PIN ON/OFF,** you have the possibility to alter the state of the output by pressing the enter button.

2. In the **DCC V2.0 (D**atatrap **C**ontrol **C**enter) the following button is integrated in the task bar: . In a pressed position it symbolizes the active state.

3. Automatic switching for the purpose of control is possible using the **alarm function** of the Datatrap V2.0. For this purpose a channel is chosen that is monitored at the time interval selected for recording. When the measurement at the channel exceeds a given threshold value or falls below it, respectively, the state of the output changes. The state of the pin is reset only when the chosen hysteresis value is exceeded (or not reached, respectively). The type of output can be defined via the states as „on“, „off“, or „inverted“.
   Following the possibilities described above (points 1 and 2), the user can alter the output at any time.



7. Datalogging

When the connection and the configuration of the sensors are completed, measurement can be started. Be sure that you have sufficient battery and storage capacities. During unbuffered operation, without external power supply, you can check the state of the battery and the remaining time in the menu **STATUS**. You may erase the memory, if necessary, using in the menu **DATA – ERASE DATA.** When the battery is nearly empty, the DATATRAP does not allow to erase any data for the sake of safety.

In the menu **CONTROL – START NOW** logging is started and stopped. Alternatively, starting or stopping the data recording can also be controlled with the **timer** or **trigger function.**
During the measurement you can observe the remaining time, the status and the battery charge in the menu **STATUS.** The actual values of measurement of each channel are displayed in the menu **CONTROL – WATCH CHANNELS.** You choose the channel using the up- or down-key.

During measurements one cannot change the configuration (**SETUP)** or the memory (e.g. by **ERASE DATA**). You are then told **PLEASE STOP LOGGER FIRST.**
In the menu **CONTROL – STOP NOW** you can stop measurements immediately or set a time for stopping in the **TIMER.**

Up to 1000 data files with varying configurations can be recorded in series. In the phase of read-out they are transferred to the PC in series.

If you want to send the data of measurement online to a PC, i.e. during recording via the serial interface in the ASCII format, you have to activate the option **ONLINE DATA** in the menu **DATA – TRANSFER SETUP.** Otherwise the online option of DCC is also available.

If the battery charge falls below a certain limit, the mode of registration is interrupted until the charge is high enough again to allow safe operation. This period of interruption is indicated in the recordings by **BATTERY LOW.**

8. Reading out the data

For users of Windows:

Use the enclosed PC program DATATRAP-Control Center (DCC) which offers a simple and quick way of reading the data out as well as the management of the configuration. After installation of the program you have to connect the DATATRAP with the PC using the enclosed **null modem cable** (also AT-link Cable). Start the DCC via the symbol on your desktop or on the task bar obtained with PROGRAMME. Select the correct COM-port in the settings and store these changes.

To establish the connection, push the CONNECT button .

For registering the data press the button DATEN EINLESEN and specify the file where your data should be recorded. The values are then presented graphically on the screen.

For all platforms:

You can use any terminal program with Windows or on any other platform. As an example, the use of HyperTerminal for reading out the data is described here as following:

1. Start – programs – accessories –HyperTerminal – Hypertrm.exe

2. Set up new connection
   Name: DATATRAP
   Connection via COM XX
   (XX: depending on the port used).

3. Connection settings:
   - baud: 19200 bits/s
   - data bits: 8
   - parity: none
   - stop bits: 1
   - protocol: none

4. Select TRANSFER in the menu bar
   - record text
   - name file (e.g. logfile_1.txt)
   - start

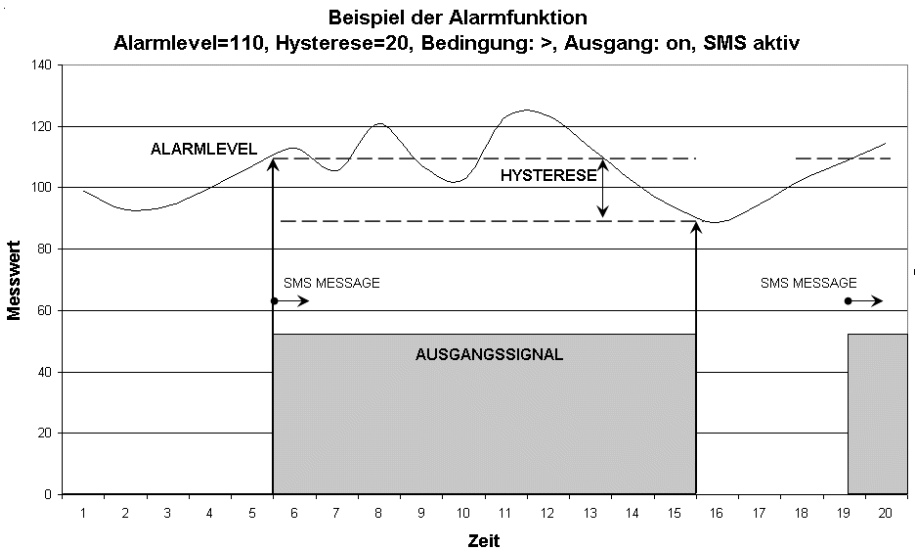
In the menu of the instrument go to **DATA → SEND TO PC**; your data are thereby transferred. The file is saved automatically when you click STOP READING. The data are given in the form of a text. The header is followed by the columns of measured values. In front of every line you find the time of recording. The columns are separated by separation symbols which can be specified in the instrument menu **DATA → TRANSFER SETUP → DELIMITER.** Possible separation symbols are: blank space, comma, semicolon or tabulator.

5. Further processing of the data:

Processing can for example be done by Excel, importing there the file as a text file. If a comma is used instead of a dot as a decimation sign, it can be replaced automatically in an editor program, such as Notepad or Word, for instance.

9. Alarm function

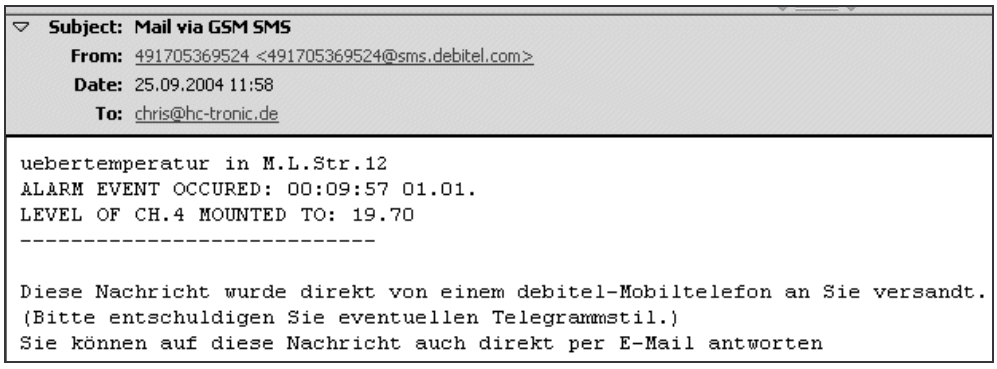
With the help of the **alarm function** of the DATATRAP V2.0 automatic notification of the user and switching for the purpose of control is available:
Select a channel which will be monitored at time intervals set for logging. The maximal reaction time for example at a sampling rate of 1s is, correspondingly, 1s.
If the value measured at the channel exceeds or falls below the given threshold value, the state of the **alarm output (pin 24)** changes. The threshold conditions can be set in the menu. The state of the pin is reset only after exceeding (or falling below, respectively) the threshold value, adding (or subtracting, respectively) the value of hysteresis. Synchronously with setting the state of alarm, there is the option of sending an SMS message (see below). The type of the output can be defined with the states On, Off or Inverted. According to 6.1 and 6.2, it is possible for the user at any time to control the output pin of the data logger by the internal menu, a terminal program or by DCC. As far as access to external hardware is concerned, you are referred to chapter 6.



SMS message

The option **„Alarm and SMS“** allows to transfer an alarm message by SMS. This requires, however, that you have a GSM modem capable for SMS (as TC35/Siemens) at the serial interface of the DATATRAP. The telephone numbers of the recipient and of the provider´s SMS service can be listed in the menu. Furthermore an alarm message can be written with 48 letters. If the service **SMS** to **EMAIL** is used, the email address of the recipient must be defined, preceding the text of the message. When you enter the address, follow the directions of the provider. The symbol @ can often be replaced, for example, by an asterisk “*”. A blank space must follow the address. Entering the text is

facilitated by establishing a connection to the DATATRAP with a terminal program, going to the submenu **ALARM MANAGEMENT** in the **SETUP MENU.** The text of the message is followed by details concerning the state of the alarm: time of day and date when the alarm was triggered, and the alarm value measured.


Subject: Mail via GSM SMS
From: 491705369524 <491705369524@sms.debitel.com>
Date: 25.09.2004 11:58
To: chris@hc-tronic.de
uebertemperatur in M.L.Str.12
ALARM EVENT OCCURED: 00:09:57 01.01.
LEVEL OF CH.4 MOUNTED TO: 19.70
Diese Nachricht wurde direkt von einem debitel-Mobiltelefon an Sie versandt.
(Bitte entschuldigen Sie eventuellen Telegrammstil.)
Sie können auf diese Nachricht auch direkt per E-Mail antworten

Example of an Alarm-SMS

10. Trigger function

In the menu **TRIGGER**, an automatic start of the logger can be defined when a certain threshold value is exceeded. Here you can select the channel, the starting value and the desired duration of recording in a range of 1 minute up to 160 hours. If the threshold value is exceeded, the DATATRAP reacts within the timeframe of the sample rate and starts to record for the desired duration of recording. If the threshold value is still exceeded after the recording period has elapsed, the duration of measurements is prolonged automatically for another period. As a continuous supervision of the trigger channel is necessary, increased power consumption must be taken into account, particularly at sampling rates below 1 s.

11. Recording timer

The built-in **TIMER** offers another possibility of controlled recording. Here one may define a **daily** time for starting and stopping the measurement or the time at a certain **date.** When a daily timing is chosen, measurements are taken daily within the same time frame. When you choose the option of „daily **Timer and SMS**“, it is possible to transfer the last set of data by SMS. This, however, requires the use of a GSM modem connected to the DATATRAP which is capable of sending SMS (e.g. Siemens TC35). In the menu the telephone numbers of the recipient and of the provider SMS service can be defined. Furthermore, a SMS heading can be written including 32 characters. If the service „**SMS** to **EMAIL**“ is used, the email address of the recipient must be entered. When entering the address, the specifications of the provider must be followed. Often the symbol @ must be replaced for instance by an asterisk “*”. A blank space must follow the address. Entering the text is facilitated by a connection to the DATATRAP using a terminal program and going in the **SETUP menu** to the item **TIMER SETUP**.

A SMS message contains not more than **160 characters**. Correspondingly, a set of data is **subdivided into many SMS**. This can become quite expensive! Therefore, this possibility is feasible especially for large sample time intervals with mean values of large numbers and few channels. Typical is the following example:

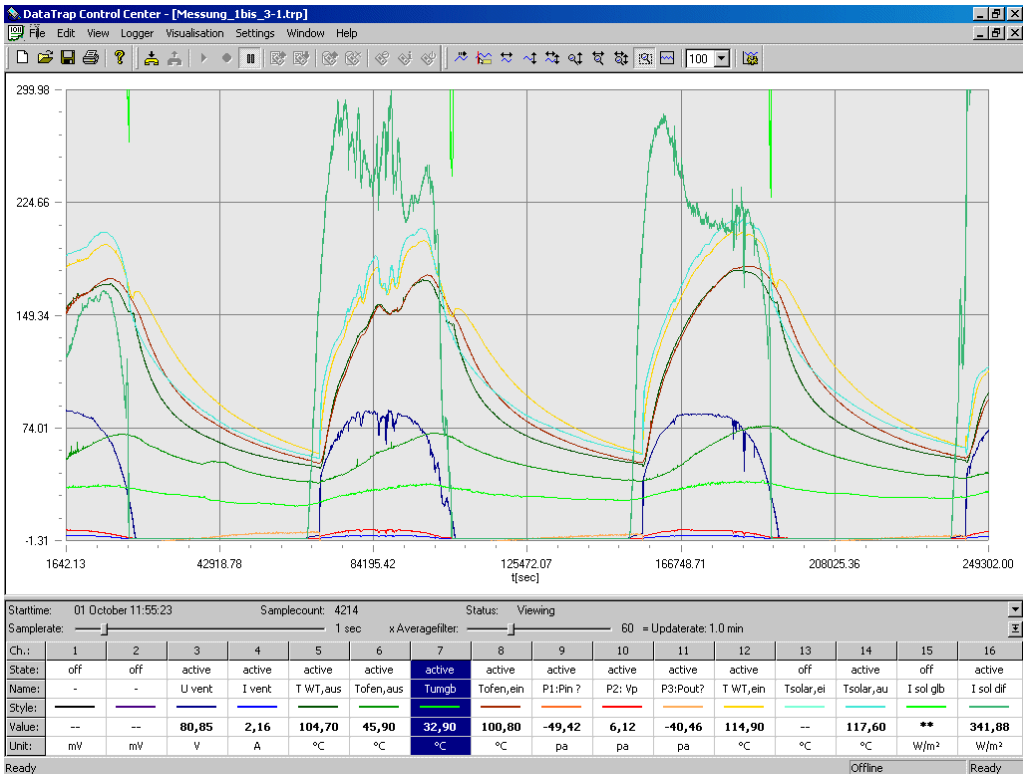
- Start of measurements by the timer at the time 0:00
- recording, for instance of temperatures or water levels, in hourly intervals (e.g. measurements every minute and saving a mean value from 60 measurements each hour)
- stop at 23:00 and data transfer by SMS to the email address.

To be considered:

A simultaneous use of the modem timer and the recording timer is not possible.

The timer activated last inactivates the other one.

12. DCC - DATATRAP Control Center


DataTrap Control Center - [Messung_1bis_3-1.trp]
File Edit View Logger Visualisation Settings Window Help
299.98
224.66
149.34
74.01
-1.31
1642.13
42918.78
84195.42
125472.07
t[sec]
166748.71
208025.36
249302.00
Starttime: 01 October 11:55:23
Samplecount: 4214
Status: Viewing
Samplerate: 1 sec
xAveragefilter: 60 = Updaterate: 1.0 min
Ch.: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
State: off off active active active active active active active active active active off active off active
Name: - - U vent I vent T WT,aus Tofen,aus Tumgb Tofen,ein P1:Pin ? P2: Vp P3:Pout? T WT,ein Tsolar,ei Tsolar,au I sol glb I sol dif
Style:
Value: -- -- 80,85 2,16 104,70 45,90 32,90 100,80 -49,42 6,12 -40,46 114,90 -- 117,60 ** 341,88
Unit: mV mV V A °C °C °C °C pa pa pa °C °C °C W/m² W/m²
Ready
Offline
Ready

Building up a connection

The DATATRAP Control Center communicates with the DATATRAP logger by its RS232 interface. DCC can communicate with the DATATRAP that is connected directly with the PC via a null modem cable as well as with the DATATRAP connected by a (GSM) Modem. In order to make a connection with the DATATRAP, you choose the type of connection in the communication settings. For modem connections to the data logger you can use those installed in the operating system. For direct connections by a null modem cable you select any of the COM ports installed in your system.

Note: ISDN adapters installed as modems with CAPI drivers are not supported by the DCC.
Note: To filesave the settings permanently, please go to Save Settings in the settings menu.

Finally you click the **Connect** button . DCC now establishes a connection with the DATATRAP logger and presents the actual configuration of the DATATRAP. As soon as logging in is completed, the indication „Connected to DATATRAP“ appears in the status string and the functions of the attached DATATRAP are accessible.

Note: If, during logging- in, the DATATRAP data logger is in the logging mode, the values of measurements recorded by the logger are transferred also to DCC, starting at the time of logging in.

Configuration

With the DCC you can determine, manage and edit configurations for your DATATRAP logger. A configuration comprises settings for the sampling rate, average values and channel settings which are determined in the channel settings dialog. The information of the configuration is part of the DCC data format (.trp); different DATATRAP configurations can thus be handled in DCC files (.trp).

With the function **send config** the configuration shown in the DCC can be transferred to the DATATRAP data logger and will be stored there permanently.

The function **load config** calls up the actual configuration stored in the DATATRAP logger and shows it in the DCC.

The oscilloscope mode

DCC allows you to use your DATATRAP data logger as a storage oscilloscope. For this purpose you configurate the DATATRAP as you require it and click the Start **Oszi-Mode** button .

On the Oszirange selection table you determine, how many measured values are to be presented simultaneously in the graphical window. In this mode of operation no values of measurements will be stored in the DATATRAP logger; but you can save the recorded values in the DCC by writing it to a file afterwards.

Tip: Use small sampling rates in the Oszimodus mode of operation.

The log mode

In the log mode you can use the DCC to watch the measurements on the screen as they are presently being recorded.

To start the log mode, click the button **Start Logmode** **.** The DATATRAP data logger is then configurated with the actual configuration and started. From now on, all values seen in the screen are stored in the logger.

Note: The DCC can be stopped without stopping the recording process of the DATATRAP logger.

Data transfer

The data recorded by the DATATRAP logger in preceding sessions can easily be read with DCC.

After you have clicked the **Load Data** button , a progress bar appears which shows the state of the datra transfer. After the transfer is completed, each logging session is presented in an individual window.

Erasing data

By clicking the **Erase Data** button all data stored in the DATATRAP data logger are irreversibly deleted.

Note: The settings of configurations are not deleted by Erase Data.

Chart Settings

With the chart dialog box you can define the following chart settings:

General title diagram	title shown above the diagram
General legend	legend to be shown to the right of the diagram
General width	width of the legend
General BgColor	background color of the diagram window
General Front Color	
Color of labelling	
X axis title	labeling of the X axis
X axis min max	range of values on the X axis
X axis unit	unit of time on the X axis
X axis precision	number of decimal places behind the comma
X axis date/time	date/time format to be used for the X axis
Y axis titlle	labeling of the Y axis
Y axis min/max	range of values on the Y axis
Y axis precision	number of decimal places behind the comma
Grid show	show grid pattern of the diagram
Grid lines X	number of grid lines on the X axis
Grid lines Y	number of grid lines on the Y axis

Channel settings

On the channel dialog box you can determine the following settings:

State	On/Off switch of a channel
Name	name of channel (max. 8 characters)
Colour	color for presentation in the diagram
Style	type of lines for presentation in the diagram
Type	defines the type of input
Unit	unit
Scale	scaling factor
Offset	offset

Concerning the selection of a sensor profile, the settings of Unit, Type, Scale and Offset are defined automatically. In DCC you can produce sensor profiles containing the setting dimensions of Unit, Type, Scale and Offset. Once a sensor has been calibrated it can very easily be adopted for a new configuration. To establish a new sensor profile, click the Save As button and choose a name. If you want to use an existing sensor profile, you select it in the box for sensor profile selection.

To change a sensor profile, click the Save As button and choose the name of the sensor profile to be altered using the selection box in the Save Sensor profile for dialog. To remove a sensor profile completely, select the corresponding profile in the selection box of sensor profiles and click the Delete button.

Note: Once sensor profiles have been defined, they are available also for further DCC sessions.

13. Remote control

Remote operation of the DATATRAP is possible, using a serial connection with the PC by a null modem cable or by a (GSM-) modem. However, an easy remote access in the graphic oscilloscope mode and access to the configuration is only achieved by the DATATRAP CONTROL CENTER (DCC).

Port settings:

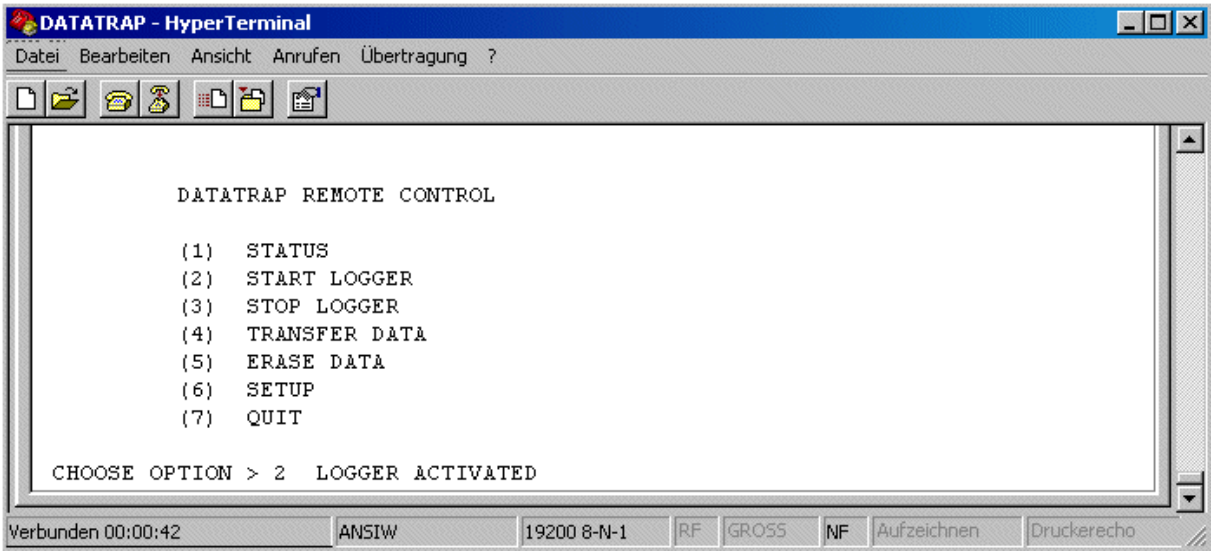
RS-232, 19200 baud, 8 bit, 1 stopbit, no parity, no hardware protocol

For the operation of the modem, it must be initialized. This is carried out on the DATATRAP in the sequence **DATA → TRANSFER SETUP → MODEM SETUP → MODEM: ON.** As you leave the menu, the initialization strings are sent to the modem. If the signals are not recognized be the modem, or if there is no modem, an error is indicated. The initialization is also effected automatically by the application of the supply voltage of the DATATRAP.

When a call is received by the initialized modem, the DATATRAP answers it automatically. With the **key word „CONNECT“** from the modem an ASCII Operation menu is transferred. In the case of direct control through a serial cable the keyword **„CONNECT“** can also be entered manually with the help of a terminal program.

In the ONLINE mode no more operation from the DATATRAP keyboard is possible. If you press a key, the DATATRAP terminates the connection.

The following screenshots shows the main menu sent from the DATATRAP:



By entering the ASCII-characters „1“ to „7“ you can remotely control the main functions of the DATATRAP. This operation is independent of the operatplatform, since it is possible with any kind of terminal program.
In the following, the functions are shown in detail:

(1) STATUS:

The main information concerning the status of the logger is given. „Remaining“ shows the time available for recording with present settings. The display can look as follows:

```
TIME 00:18:13 21.06.
STATUS: LOGGING
REMAINING: 15 days 18h
BATTERY: 100%
```

(2) START LOGGER:

Possible responses are:

```
LOGGER ACTIVATED
STOP LOGGER FIRST
MEMORY FULL
```

(3) STOP LOGGER:

Possible responses are:

```
LOGGER STOPPED
NOT ACTIVE
```

(4) TRANSFER DATA:

Transfer of all data in the ASCII mode. Transfer is stopped by pressing the ESCAPE key. The display of each data file shows in the beginning the time of start and the configuration data:

```
Datatrap Version 1.60

File: 1
Start Time:  09:36:56 07.08.
Samplerate :          1 sec
Average out of:       30 samples
Timeinterval:         30 sec

Channel  Unit      Scale  Offset
4            ℃       0.10   -12.00
5            ℃       0.10   -12.00
6            ℃       0.10   -12.00
7            ℃       0.10   -12.00
8            W/m2    0.55   0.0

CH4[℃]      CH5[℃]      CH6[℃]      CH7[℃]      CH8[W/m2]
84.60       94.00       41.70       33.10       322.85
84.20       93.80       41.60       33.00       336.05
84.20       93.70       41.30       32.80       347.60
84.10       93.70       41.10       32.90       348.15
84.60       93.60       41.10       33.00       359.70
83.90       94.60       44.20       33.20       335.50
84.00       93.40       41.30       32.90       330.00
END
```

(5) ERASE DATA:

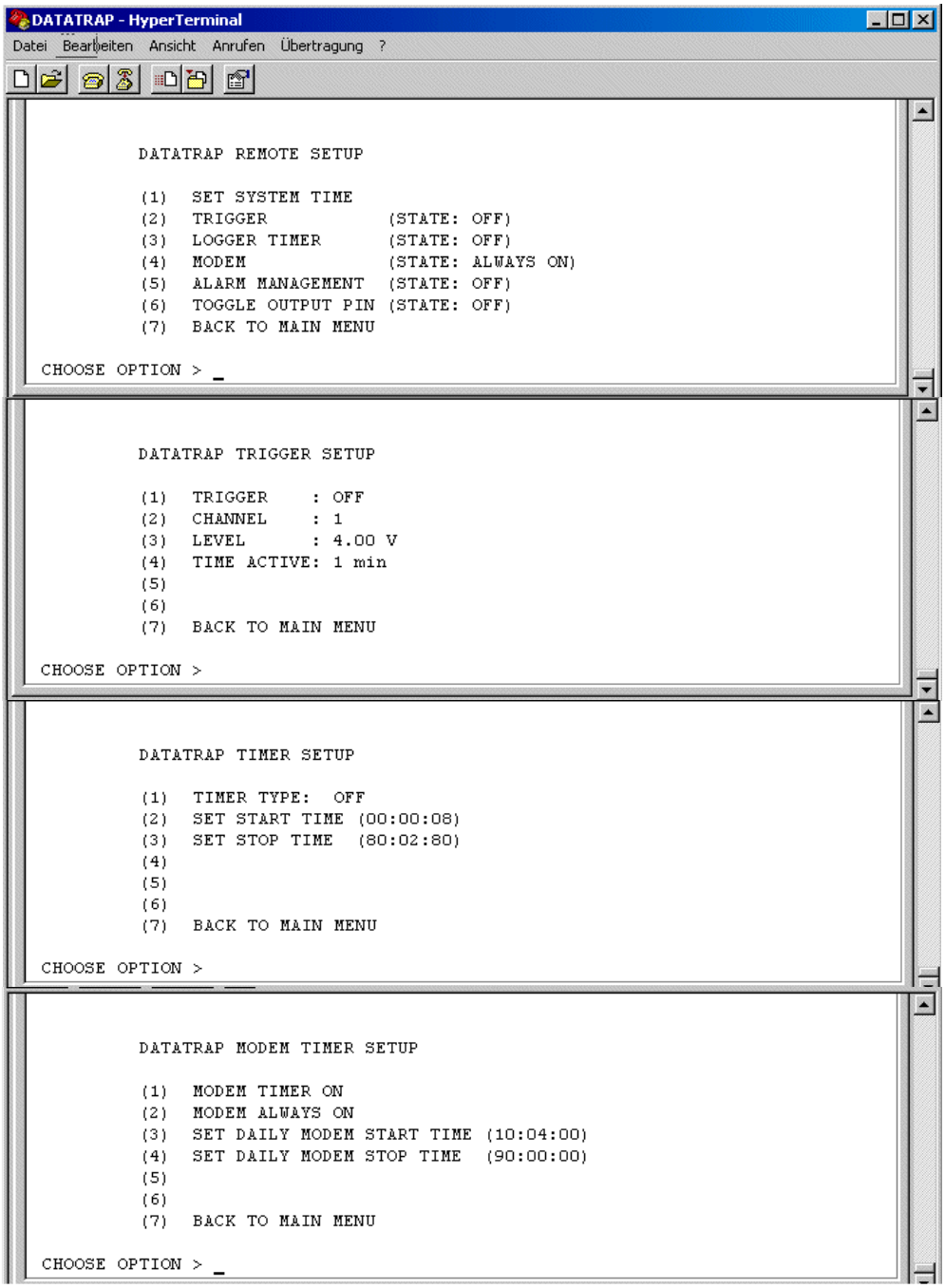
Deleting data in memory. The data of the configuration are conserved.

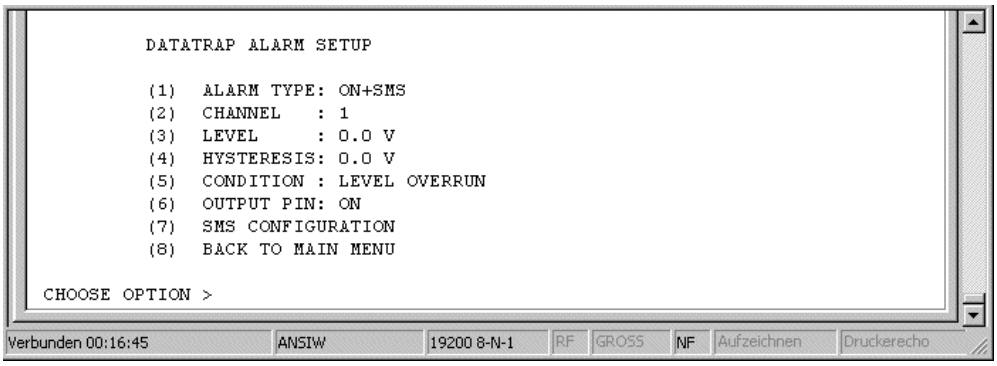
The progress is indicated by 10 bars:

ERASING ########## 540 kB free

(6) SETUP:

Offers possible settings for modem control, such as programming the daily time frame for remote access, the setting of the time of the system and the manual control of the output signal. Furthermore, the start of the trigger, timer of the logger and the alarm management can be configured. The following screenshots show various setup menus.





(7) QUIT:

Terminating the connection. The Datatrap sends the modem a string to hang up.

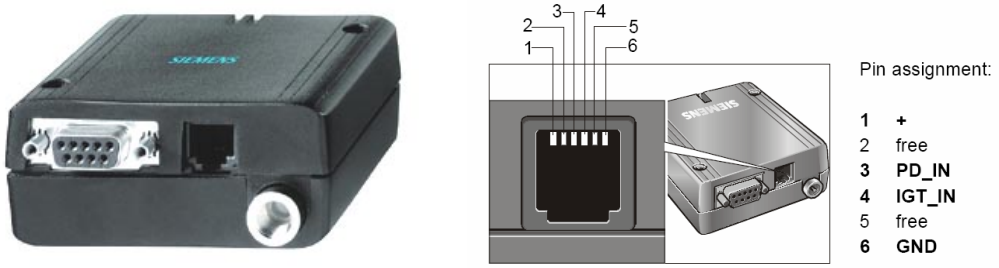
GOOD BYE +++ATH

14. Using a GSM modem (e.g. TC35T by Siemens)

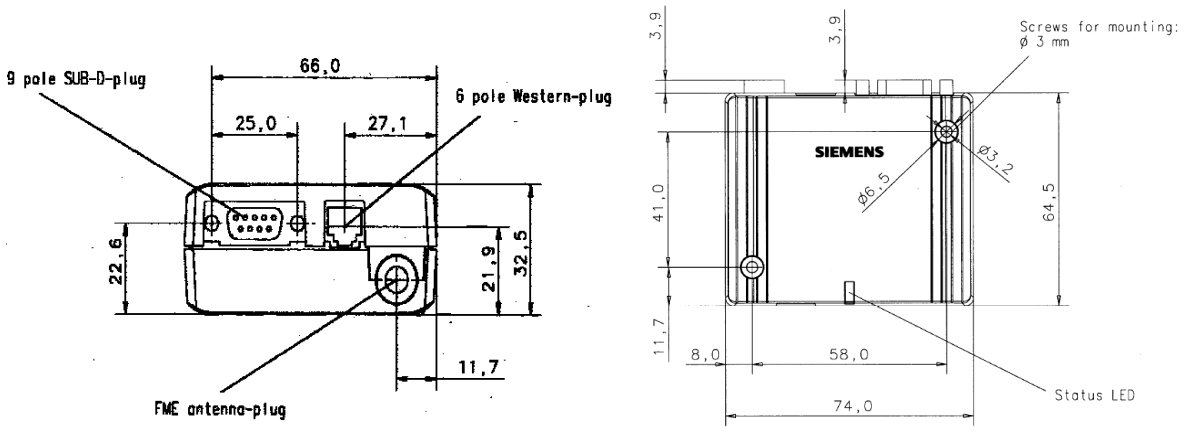
A GSM modem can directly be connected to the serial port of the DATATRAP using a serial cable. In the case of the TC35 the energy management of the modem can be controlled by the DATATRAP. However, you need an additional power supply running the TC35. Normally a 12V lead-gel battery providing a few Ah is sufficient. Furthermore a GSM antenna with a FME- plug and a SIM card with data service contract are necessary.

Technical data of the TC35:

Type:	Dual-band transmission modem for 900 MHz and 1800 MHz
Data interface:	V.24/RS232 (9 poles) with standard gages
Transmission:	Standard 9600 Bit/s, CSD 14400 Bit/s, V.110, Fax, SMS
SIM card:	Slot for GSM mini-SIM-card (e.g. D1, D2, E+,O2)
Transmission power:	2 Watt at 900 MHz, 1 Watt at 1800 MHz on FME plug
Set of command:	AT+C-standard, SMS-text and PDU mode
Other:	size 75x64x33 mm,
Voltage supply:	8...30 VDC
Current consumption:	Talk: 190 mA, Standby: 40 mA, Power Down: 0.8 mA



TC35(Siemens) with serial port, power and antenna plug



Before a TC35 module can be connected with the DATATRAP V2.00, the manufacturer´s settings of the TC35 module must be changed using any terminal program, e.g. Hyperterminal of a WINDOWS system. For this purpose the Hyperterminal must be set as follows:

Bits per second	= 9600
Data Bits	= 8
Parity	= none
Stop Bits	= 1
Protocol	= none

Then the local baud rate must be adjusted on the TC35 module and the PIN number request must be switched off. The PIN request of the GSM modem should be switched off, because a PIN number cannot be transmitted to the TC35 by the DATATRAP V2.0. This way booting without intervention of the user can be established.

Adjusting the local baud rate on the TC35 module:

Command for 19200 Bits/s: **AT+IPR = 19200**

When the TC35 module has received the directions, it signals OK and the desired value of the transmission rate is deposited in a non-volatile storage. Thereby the change of the local baud rate remains active also after operating the On/Off-switch of the TC35 module.

Commands for switching off the PIN request:

One must take care that the correct PIN number is supplied. If a wrong PIN is entered into the TC35 more than three times in a series, the SIM card is blocked absolutely.

Entry of the PIN number:

AT+CPIN = „XXXX“ (XXXX are the 4 digits of the SIM card).

It can take several seconds after entering the PIN number until the TC35 responds with OK. It is only after a positive response that the next command can be transmitted.

Switching off the PIN-request:

AT+CLCK = „SC“, 0, „XXXX“ (XXXX are the 4 digits of the PIN of the SIM card).

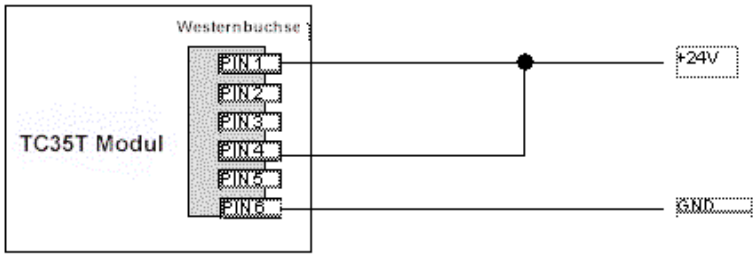
As soon as the TC35 has responded to these directions with OK, no PIN entry is necessary anymore for connecting to the D1 net.

Rate of transmission in the D1 net:

For data transmission in the D1 net there are at present 9600 Bit/s available for standard communication. For this reason only the baud rate 9600 was tested with the TC35 module and provided for use.

Connection of the TC35T to an 8-24V power supply:

The TC35 module has a 6 pole Western socket for attachment to a power supply. A 6/6-RJ2 – plug must be used. Pin assignment of the Western connector:



Connection to an antenna:

The TC35 module can be directly attached to the antenna cable. To prevent any influence on the sensitive measurement inputs of the DATATRAP, the antenna should be positioned at a great distance and/or should be well shielded.

15. Modem power management

For measurements in places where there is no external power supply, the GSM modem TC35 can – at preset times of day - be powered down via the serial interface cable in order to save power. The DATATRAP V2.0 activates and initializes the modem at the set starting time and switches into the sleeping mode at the time determined for stop. This way only 0.5 mA are consumed instead of the 40 mA necessary in the standby mode.

When you start after a complete loss of power, the modem is shifted into the permanent standby mode. This way it is possible for the user to get the control at any time, as the timer of the datalogger may not anymore work with the proper time.

The time window may be set directly in the menu of the DATATRAP under **DATA → TRANSFER-SETUP → MODEM SETUP → SET START/STOP TIME**. The setting may as well be accomplished by remote control from the **DCC** (DATATRAP Control Center) with **LOGGER → SET MODEM TIMES** or by any terminal program in the DATATRAP ASCII menu **SETUP → MODEM → ....**

Attention: The modem timer and the recording timer cannot be used simultaneously. The timer activated last inactivates the other.

16. Reserved control characters

Control characters used by the **DCC** Datatrap Control Center and remote control

Befehl	*Steuer-zeichen*	*Beschreibung*	*Antwort*
Load data (binary) (continue = 208)	200	Logger sends the data stored in flash First two blocks show the number of blocks with 264 bytes Maximum number of blocks: 2047	"END" or "ERROR"
Write Config into Ram	201	The shortened config is inscribed into the logger ram, size of the shortened config == 21 Byte	"OK" or "ERROR" "END" or "ERROR"
Write Config into Flash	202	The complete config is inscribed into the logger flash, size of the complete config == 264 Byte. Logger start	"OK" or "ERROR" "LOGGER ACTIVATED"
Read Config from Flash	203	The complete config is read from the logger flash, size of the complete config == 264 Byte	"END" or "ERROR"
View Status	204	Inquire logger status	"Status as String"
Write system time	205	Transfer time of system to the logger	"OK" or "ERROR" "END" or "ERROR"
Oszi On	206		
Oszi Off	207		
View Status	"1"	Calling up status informations as string	
Start Logger	208 "2"	Starting the logger with the actual flash config when additionally oszimode -- data transmission (raw)	"LOGGER ACTIVATED"
Stop Logger	"3"	Stopping the logger (resets also the osziflag)	"LOGGER STOP"
Load data (Ascii)	"4"		
Erase data	"5"	Erasing data in the flash (progress indicated by 10* #) „free“	"free"
Quit	"6"		"GOOD BYE"

17. Trouble shooting

The following may help to solve frequent problems:

Problem: *Fluctuating voltage is indicated at times when the instrument is not connected with the measuring equipment, or when no voltage is present at the input, respectively.*
Comment; If the corresponding channel is configurated as a 0-400mV input, these fluctuations are normal. The amplifier input floats as long as there is no signal. If any voltage is applied, this error should not occur.

Problem: *During voltage application by means of the provided mains adapter the voltage measured varies between 0 and 15 mV, also the voltages present at the input.*
Comment: Problems can occur for measurements that are not potential-free. Potentials can arise in the case of measurements on mains-operated equipment. A problem in this respect may be the provided switching power supply. It has the advantage of low power consumption and compact dimensions, but it has no galvanic separation between the primary and secondary parts. Therefore, for measurements on equipment that is not potential-free the stray effects can be minimized by the use of a wall power supply which uses a transformer (12V/ 100mA). Fluctuations of maximally +/- 2 steps are still permissible and correspond to the specifications of the internal A/D converter. Noise can be reduced by the averaging function while logging.

Problem: *The temperature measured with the thermal element fluctuates +/- 0.3°C.*
Comment: Thermal elements produce very low voltages in the range of millivolts. This increases the sensitivity to electromagnetic noise pick-up. This effect occurs particularly in the vicinity of strong sources of interference. In this case one should use shielded thermocouples and short cable length. To avoid errors, conducting contacts of the wires to metals should be prevented, especially when using many thermal elements at the same object.

Problem: *Appearance of strange letters on the display.*
Comment: This effect can appear when the configuration of the logger has been destroyed. (This can happen, for instance, when the flash storage is erased at too low supply voltage). Load the basic configuration: Take out the battery and attach the instrument to the wall power supply while you keep the ENTER button pressed. The display then shows DEFAULT CONFIGURATION.
Tip: *Please use only NiMH-9V batteries, since their state of charge is recognized by the DATATRAP*

18. Technical data

Storage:	Flash-Eprom for 270.000 values of measurement (conserves the data also in case of power failure)
Samplerate:	50 ms – 60 min, average formation from max. 200 values. Error: < 1 ms / interval
AD-converter:	Resolution **12 bit** Relative error: +/- 1 LSB Differential Nonlinearity : +/- 1 LSB Offset error: +/- 3 LSB Gain error: +/- 3 LSB
Inputs:	**16 configurable channels:** Thermocouple Type K (NiCrNi) (-50°C - +350 °C, –50°C - +1200 °C) 0 - 409,6 mV 4 – 20 mA 0 – 4,096 V Channel 1 – 3: 0 – 40.96 V, Channel 16: 0 – 32,768 kHz, or 0 – 32768 impulses (<2,0V low, > 2,5V high), min. duration of impulse: 1 ms
Outputs:	Switch output 5V (manually, by remote control or alarm function) Active: 15 mA vs. Mass, inactive: 2mA 5V (open drain) Switched feed-in of sensors: 5V, 50mA max., warm-up time ~5ms
Special functions	Start by trigger at threshold of preset time (1 – 60 min) Start and stop by timer and optionally daily transmission of the data By SMS or SMS-email Alarm function with adjustable hysteresis, alarm output and Information by SMS or SMS-email.
Port settings:	RS232 with 19200 Baud, built-in modem support for remote polling (from modem protocol V.34) GSM modem support and support of SMS function
Supply:	9V NiMH battery internally (trickle charge with external power:ca.3mA), Voltage of external power supply: 6V – 24V DC, Current consumption: 0,2mA (display at: 5mA), high Sampling rates > 10Hz: ca.10 mA Duration of operation: approx. 4 weeks with built-in battery without buffering. Power management for TC35 modem through serial interface (500µA Standby). Optional: solar mini module for unlimited time of measurement
Software:	Operation and data transfer by the convenient **DCC** DATATRAP CONTROL CENTER (min. Windows 95) with graphical Presentation of the measured values. Or: Platform independent Operation with any kind of terminal program.

CE

19. Warranty conditions

DATATRAP V2.0

Period of warranty: 2 years

1. In case of faults of hc-tronic hardware, accessories and materials hc-tronic offers to the buyer a warranty limited to the period of time indicated above, beginning at the date of purchase. Within this period a demonstrably defective product will be repaired or exchanged at the expenses of hc-tronic. Replacements can be new or as good as new.

2. hc-tronic does not give a guarantee, however, that this product will function without possible interruptions or errors. If hc-tronic cannot provide for a replacement within an appropriate period of time according to the warranty conditions, the customer is entitled for reimbursement of the purchase price after returning the product.

3. The products of hc-tronic can contain used parts which are comparable in their capabilities to new parts.

4. The warranty is not valid in the case of damages caused a) by improper maintenance and service, b) by use of software, interfaces, parts or materials from other manufacturers, c) by modifications done without consent of hc-tronic or by incorrect use, d) by operation of the product under environmental conditions other than those prescribed by hc-tronic, or e) by inappropriate preparation or maintenance of the location.

5. CLAIMS AGAINST HC-TRONIC EXCEEDING THE WARRANTY DESCRIBED ABOVE ARE EXCLUDED. VERBAL OR WRITTEN AGREEMENTS ARE NOT ACKNOWLEDGED. WARRANTY CLAIMS ARE LIMITED TO THE PERIOD OF TIME INDICATED ABOVE INASMUCH AS THIS WARRANTY IS LEGALLY PERMITTED. Besides the warranty de scribed here the claims mandatory by law are valid.

6. CLAIMS AGAINST HC-TRONIC AS WELL AS ITS AUXILIARY PERSONNEL ARE EXCLUDED INDEPENDENTLY OF LEGAL GROUNDS (E.G. CONSULTATION, POSITIVE DEFAULT IN CONTRACT OR NONPERMISSIBLE ACTION), ESPECIALLY ALSO CLAIMS FOR INDIRECT AND CONSEQUENTIAL DAMAGES. This does not apply inasmuch as there is obligatory liability for damages of privately used property (on the basis of the Produkthaftungsgesetz) or in cases of deliberate acts, of gross negligence or missing warranted properties of the product.

CONTACT ADDRESS

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